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Forest Pest Management

Pacific Southwest Region

Date: May 25, 2000
File Code: 3420

To: Chuck Barat, Chief of Resource Management,
Lava Beds National Monument (Report # NE00-13A)

Subject: Caldwell Butte Prescribed Burn

At your request, I conducted a field evaluation of the Caldwell Butte prescribed burn on May 9, 2000. You and I were accompanied in the field by Kelly Fuhrman, Natural Resource Specialist and Al Augustine, Fire Management Officer for Lava Beds National Monument.
The objective of my visit was to determine the cause of the ponderosa pine mortality that has occurred since the burn.

Background Information

Vegetation in this area consists of approximately 60% ponderosa pine with bitter brush and sage in the understory and the remaining can be classified as open spaced bitter brush, mountain mahogany and bunch grasses with widely scattered junipers and ponderosa pine trees. Tree ages and size classes vary on this rather low site that is dominated by very dry, pumice soils. The average precipitation for this area is between 16 to 18 inches annually.

The Caldwell Butte prescribed fire was ignited on October 4 and 5, 1997 and encompassed about 200 acres. The primary objective of the prescribed fire was to reduce fuel loading throughout eagle roost habitat. In the Fire Report, prepared by Walter Herzog, Lead Fire Monitor, he indicated that on the first day of the burn, October 4, the bitter brush burned readily, but the fire did not continue to spread to adjacent brush or areas of sparse grass. He noted, "Because of the discontinuous fuels within the brush, ignitors had to light practically each bush to burn it." Due

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to the inability of the fire to spread on its own, brush was ignited under the pine trees where there were more continuous fuels. It appeared that the moist soil conditions and inadequate winds to carry the fire limited the burning. On October 5, the fire carried well through the needle cast litter and bitter brush, but did not spread freely on its own due to higher humidity and high soil moisture. In the Fire Report, Mr. Herzog indicated that the fire intensity would build and spread up to about 20 feet but could not sustain itself and would die down. Pine trees were torched occasionally in areas of heavy needle cast and bitter brush, but typically crown scorch was very low and rarely exceeded 25% of the lower live crown.

Some post-fire mortality was observed in the ponderosa pines in 1998 by Park personnel and was attributed to the prescribed fire. In 1999 about 100 trees were observed to be dying in the prescribed fire area and during the spring of 2000 additional trees with fading crowns were observed.

Field Observations

Most of the post-prescribed fire-related conifer mortality I have observed over the past few years has been attributed to cambium or crown scorch sustained during the burn. Since returning to normal or above normal precipitation regimes in 1995, post-prescribed fire or wildfire-related conifer mortality that could be attributed to bark beetles has been very low. I examined several trees in the Caldwell Butte prescribed fire that had fading crowns. Typical of most of the pine trees, these trees had very little, if any, crown scorch and varying amounts of bark scorch on the boles. Old pitch tubes created by red turpentine beetles, *Dendroctonus valens*, were present at the base of some trees, but their attacks were not extensive enough to cause tree death. No other *Dendroctonus* sp. were present (ie. western pine beetle or mountain pine beetle). Flatheaded wood borers, *Melanophila californica*, were found under the bark on the lower boles, but they would not be considered to be the primary cause of tree death. I examined the cambium at ground level and determined that the fire had been hot enough or of long enough duration to kill in excess of 75% of the circumference and on some of the trees the entire circumference had been killed.

It is not uncommon that trees are able to survive their fire-related injuries for several months or even a few years, particularly if precipitation levels are close to normal and bark beetles are not involved. Although visual examination of the crown and bark would not indicate that the fire was intense enough to cause severe cambium kill, it is likely that the inability of the fire to move freely through the stand due to high humidity, soil moisture, and lack of wind, played a significant role in the duration of the heat around individual trees. Any trees that sustained in excess of about 25% cambium damage can be expected to die. At this time there is no indication of bark beetle activity that might cause additional mortality, but continued monitoring of the trees in the prescribed fire area is recommended. Pitch tubes on the mid to upper bole are indicative of mountain pine beetle or western pine beetle attacks.

For future burns in this type of vegetation, it may be prudent to do some thinning around the individual ponderosa pine trees prior to initiating a prescribed fire, particularly in types of habitat (e.g. eagle roost) where management goals are to retain the overstory pine trees. Forest Pest Management funds are available annually on a competitive basis and can be used to complete

bark beetle prevention thinning projects in conifer stands. If you have any questions or would like additional information regarding this funding source please contact me at 530-252-6667 or email at ssmith@fs.fed.us.

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U.S. DEPARTMENT OF AGRICULTURE FOREST PEST LEAFLET 55

Forest Service July 1961

Red Turpentine Beetle

By Richard H. Smith [1]

The red turpentine beetle (*Dendroctonus valens Lec.*) is the largest and most widely distributed bark beetle in North America. It belongs to a group that characteristically mines between the bark and wood of trees. Some of its closest relatives are the most destructive known killers of coniferous trees.

The red turpentine beetle is a common pest of forest, shade, and park trees of pole size or larger. It has been recorded from at least 40 species of domestic and foreign conifers. Yet, despite the abundance and wide distribution of this beetle, outbreaks have been neither extensive nor severe. The red turpentine beetle has been found most

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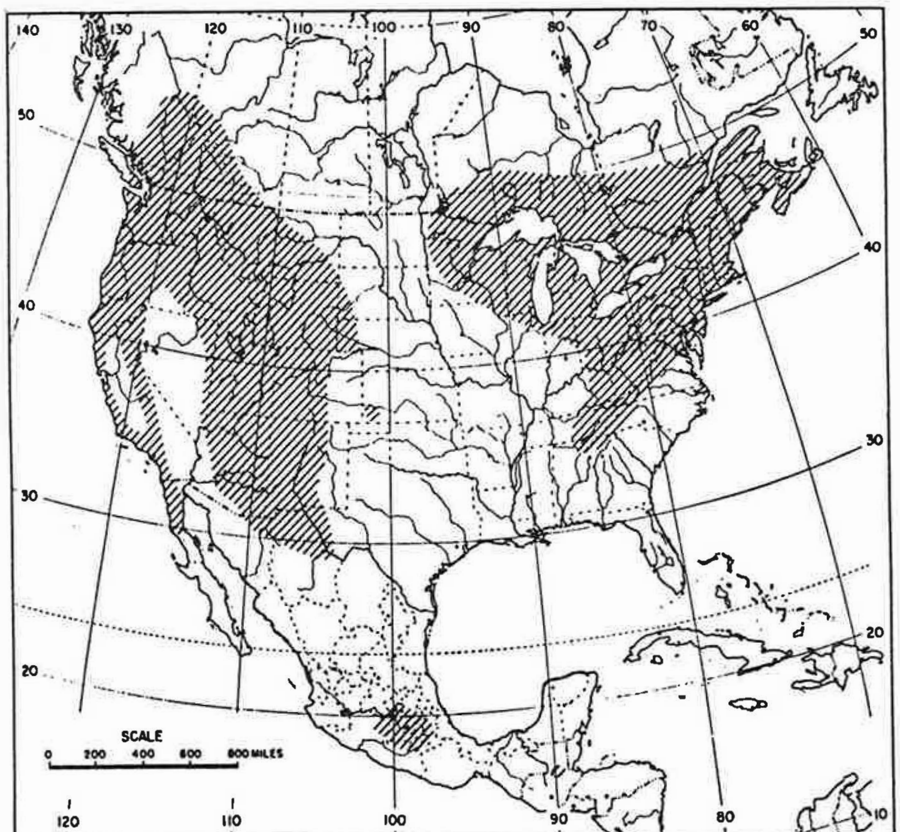

FIGURE 1.—Generalized range of the red turpentine beetle.

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FIGURE 2. Pitch tubes of the red turpentine beetle at base of a pine.

frequently in individual trees or in groups of trees in localized areas. Pines are the most common host by far.

The insect usually attacks trees of reduced vigor or those infested with other bark beetles, but it can attack apparently healthy trees. It is especially destructive to Monterey pine, and in some park areas in California has attacked as much as 15 percent of this species. At times the insect is also destructive in areas disturbed by fire, logging, or land clearing. Up to 3 percent of the residual pine in some stands have been attacked soon after logging. On construction sites, injured trees or those adjacent to fresh lumber frequently become infested.

Range and Hosts

Except in the southern Atlantic and Gulf Coast States, the red turpentine beetle the conifer forest areas of continental United States, southern Canada, and Mexico (fig. 1). There is one record of its occurrence in Guatemala, and it may extend farther north in Canada and into Alaska. Its range is quite similar to the range of ponderosa pine in the West and of eastern white pine in the East. In the extreme southeastern United States, it is replaced by a very closely related species, the black turpentine beetle. Where their ranges touch or overlap, the identity of the two species is often confused.

All serious damage by the beetle in the past has been to pines. The trees in which it is most frequently found are red, lodgepole, and jack pines in the North; white, pitch, and shortleaf pines in the East; and Monterey, ponderosa, and sugar pines in the West. Monterey pine is the tree most frequently attacked, according to existing records. Attacks on the other genera of conifers—spruce, larch, true fir, and Douglas-fir—are infrequent and have never been serious.

Evidence of Attack

Attacks of the red turpentine beetle are concentrated in the basal 6 feet of the tree, though an infrequent attack may be made above a height of 12 feet. Indicators of an attack are a pitch tube on the outer surface of the bark (fig. 2), boring particles either in bark crevices or on the ground at the base of the tree, or pitch pellets on the ground.

Resin which flows from the wood, the insect's frass, and bark borings are mixed in the gallery (tunnel) and pushed outside the entrance hole by the beetle. The mixture can either adhere to the bark surface and form a pitch tube or it can fall to the ground in various-sized pitch pellets. Pitch tubes vary in size, texture, and color, depending on the kind of tree and the relative amounts of bark borings and frass embedded in the resin. Resin is usually white to yellow and borings are red. On pines the tubes may be as large as 2 inches across. On other species of trees such as fir or spruce which produce little resin, the tubes may be small or absent, though small pitch pellets or boring dust can be found on the ground around the base of the tree.

Galleries, always located between the bark and wood of the tree, are the internal evidence of attack. They are generally vertical and may be partially packed with granular, reddish, pitchy borings or frass. The galleries vary in width from one-half inch to more than 1 inch, and in length from a few inches to several feet.

Often it is the dying tree that focuses attention on an attack. As to yellowish green, and then through shades of yellow and sorrel to red (fig. 3). In most cases this fading of the needles is associated with attacks by other insects, primarily bark beetles.

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FIGURE 3.—Ponderosa pine, adjacent to a freshly cut stump, dying after being attacked by the red turpentine beetle.

Description

In the development of this insect, as in all beetles, there are four stages: egg, larva, pupa, and adult. The egg is shiny, opaque white, ovoid cylindrical, and a little over

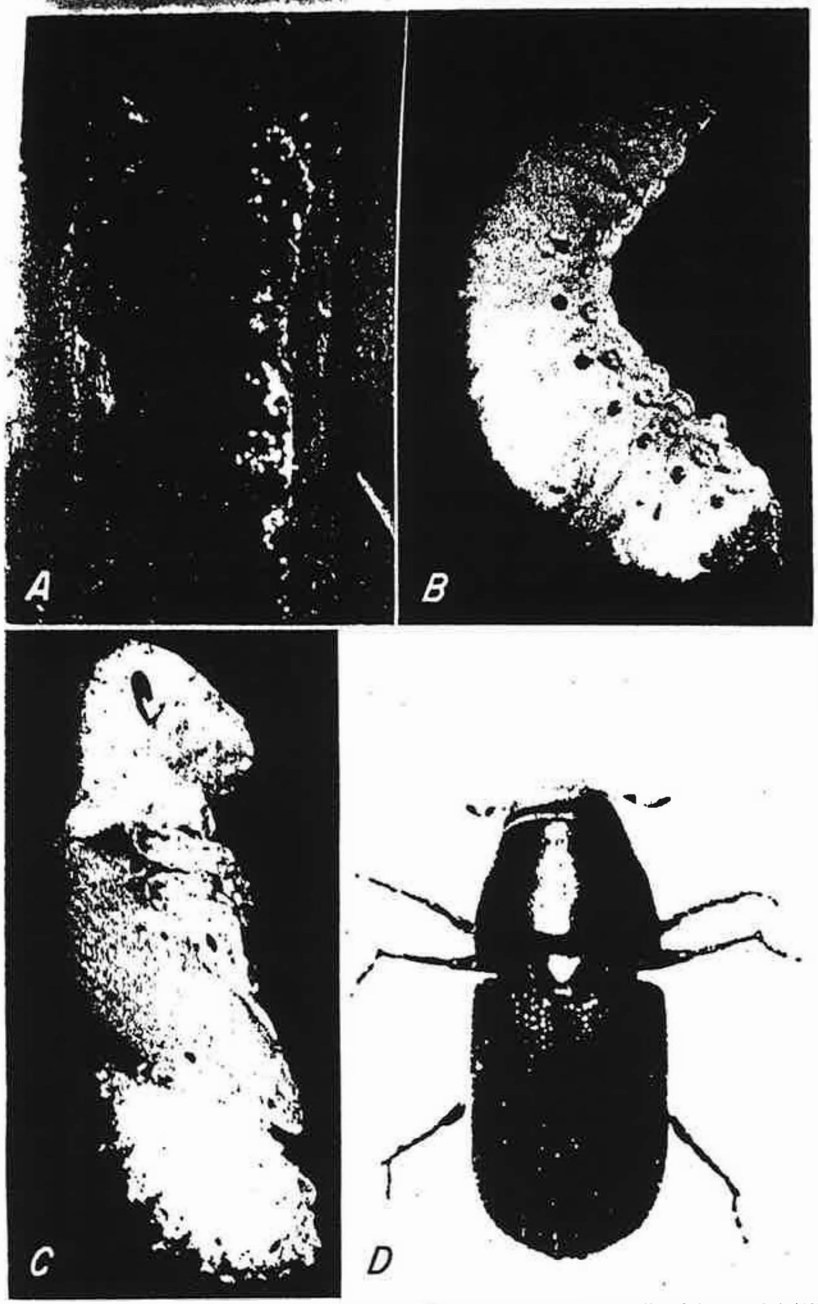

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FIGURE 4.—Life stages of the red turpentine beetle: *A*, Pencil pointing to mass of eggs along gallery; *B*, larva; *C*, pupa; *D*, adult.

rva, which hatches from the egg, grublike, legless, and white except for a brown head capsule and

With growth, a row of small, pale brown tubercles becomes evident along each side of the body. The 12 mm. when full grown (fig. 4, *B*). It transforms into the pupa, slightly shorter than the larva but still white (fig. 4, *C*). In the pupal or resting stage nonfunctioning wings, legs, and antennae are held against the body. The pupa changes to a beetle, typically 6 to 10 mm. long and quite stout. At first the beetle is tan colored and is called a callow adult, but it rapidly darkens to a reddish brown (fig. 4, *D*).

Life History

The attack starts when the beetle flies to the bark on a tree, root, or stump. Usually, flying activity peaks early in the spring after several warm days. Most beetles come from freshly cut stumps and dying trees. Upon reaching the bark, the female bores inward through the outer corky bark and the inner spongy white bark, called phloem, to reach the wood. She is soon joined by a male. Though they do not bore into the wood, they may score it a bit. Their boring proceeds generally downward, though at first the gallery usually has a lateral or even slightly upward direction. Where attacks are made just above the ground line, the gallery may run below the ground line and along the larger roots. The boring is rapid and may exceed an inch in one day. Usually two beetles, a male and female, are in a gallery; infrequently one to four are present.

Though a small amount of resin is encountered in the phloem, most resin that flows into the gallery comes from the sapwood. The resin, mixed with boring particles and frass, is pushed to the outer surface of the bark. The male seems to have the major responsibility for pushing the frass and resin out of the gallery.

Eggs are laid in an elongate mass along the side of the egg gallery

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FIGURE 5.—Adult gallery and eggs of the red turpentine beetle in phloem tissue of ponderosa pine.

from the adult gallery by a wall of pitchy borings. The egg mass can extend from one to several inches along the gallery; the number of eggs in it varies from a few to more than a hundred. A single female may deposit one or more groups of eggs farther along the gallery, usually several inches or more below the previous group. The parent beetles continue to feed in the gallery for several weeks. They then may bore out through the bark and make additional attacks or they may die within the gallery.

In vigorous trees the flow of resin apparently prevents egg-laying. Beetles may remain in these trees for several months, enlarging their galleries laterally or vertically but seldom depositing eggs. Two factors directly associated with the insect's action are sometimes assumed to enhance its success by decreasing the flow of resin from the sapwood of the tree. One is the introduction or invasion of blue-stain fungi and yeasts, which grow in the sapwood surface of the gallery. The other is the lowering of the moisture content of the sapwood as a re-

In summer the eggs hatch in 1 to 3 weeks. The small larvae, which emerge from the eggs, feed gregariously away from the adult gallery, always feeding in the phloem tissue between bark and wood (fig. 6, *A*). As they grow, they feed more extensively and make an irregularly margined, fan-shaped gallery (fig. 6, *B*). The larvae literally feed shoulder to shoulder in an irregular line, steadily moving forward into fresh phloem. Their action closely resembles a fire creeping across a dry field. If a well-developed gallery is exposed at its margin, it is not uncommon to find a handful of larvae in just a few square inches. Their feeding thus kills a patch of phloem which can be from a few inches to more than a foot wide.

As the larvae reach their full growth, they make separate cells in which to transform. In constructing these cells, they may scoop out bits of wood or bark. The cells are located between bark and wood, either in the area of the gallery (fig. 6, *C*) or a short distance forward into the fresh phloem. Here the larvae change to pupae, which in turn transform into adults.

The new adults move about in the gallery area for a few days or more, but in warm weather they soon bore outward through the bark and fly away. Several may use the same exit hole. Mating has been observed after beetles have left the tree. The beetles are capable of flying more than 10 miles. When actively feeding in a tree they may live for several months.

The rate of development of a generation and the number of generations per year are largely dependent on temperature. In the Sierra Nevada of California, the usual developmental periods in summer are about 2 weeks for the egg, 8 weeks for the larva, 1 week for the pupa, and 1 week for the callow adult. In the northern latitudes and higher elevations, 2 years may be required for a single generation, though in most areas there is at least one generation a year. In the southern latitudes and lower elevations, there may be two or three generations in a year.

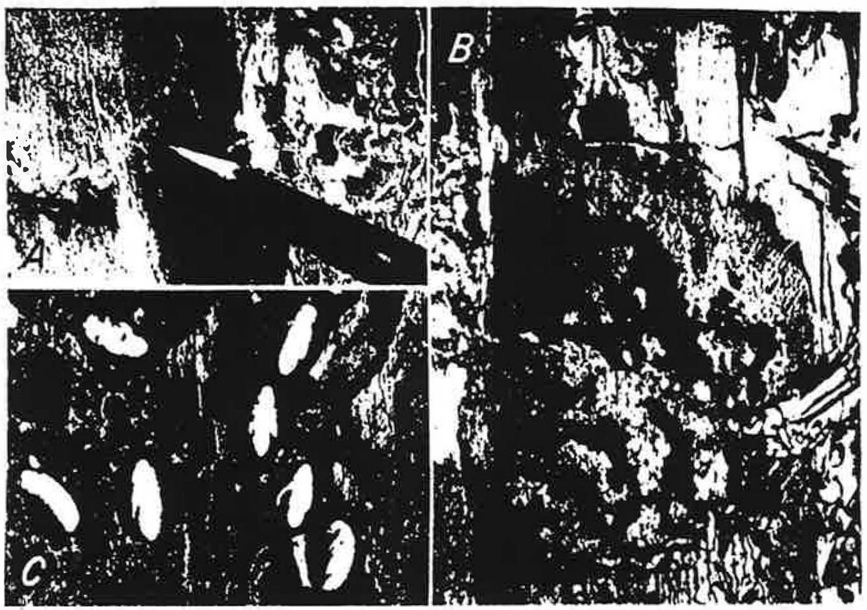

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FIGURE 6. Development of galleries: *A*, Young larvae feeding away from adult gallery; *B*, fan-shaped gallery and ¾-grown larvae (lower right); *C*, pupae and

In the warmer parts of their range, the beetles may fly intermittently during the milder winter months. In the colder parts, the winter is passed in hibernation, chiefly in the adult stage and to a lesser extent in the larval stage. Pupae and eggs rarely overwinter.

Attack Habits

The primary places of attack are freshly cut stumps or the bases of trees that are dying, often from an attack of other insects. In these places, the beetle is most successful in reproducing in large numbers. Though there is no damage under these conditions, the increase in population may be a threat to nearby trees. Fresh-cut logs with thick bark may be attacked but are not considered a source of large numbers of insects.

The second most frequent place of attack is the exposed roots and the base of trees that are weakened by roadbuilding, logging, and land clearing, and drought, fire, lightning, and the activity of other insects. In these situations, the beetles often produce broods and at times kill trees. The beetle may be found in trees where homes have been built in stands of conifers. Such construction activity can weaken many trees, the insect can further weaken them, and some may eventually die. The beetles can persist in such places for more than one season.

The beetles are often attracted to healthy trees near freshly cut logs and lumber, and to stands attacked by other species of bark beetles. Many attacks on apparently healthy Monterey pines result in the [illegible]

On healthy trees of other species most attacks are not successful, though exceptions have been noted, particularly in ponderosa and eastern white pine. In attacking healthy trees, the beetle in most instances merely excavates irregular galleries without laying eggs. Such attacks do not kill the tree, but apparently predispose it to the attack of other bark beetles at higher points in the tree.

In Western United States the red turpentine beetle is most frequently associated with the pine engraver beetles (*Ips* spp.) and the western pine beetle (*Dendroctonus brevicomis* Lec.), which often attack trees before the red turpentine beetle does.

Attacks, especially on vigorous trees, may extend over a period of 2 years or more.

Control

The effects of biological factors on the red turpentine beetle are not well understood, and have not been closely studied. Occasionally an insect parasite or predator has been found destroying some of the forms of this insect beneath the bark. Some of the broods observed were apparently being destroyed by a disease. Many beetles die in their attempt to attack healthy trees. Woodpeckers feed on the larvae and pupae. The competition for food within and between broods may also result in reducing the number of larvae. However, little positive control can be accomplished with these natural agencies.

Attention to tree and stand conditions offers some opportunity for applied control. Damage to stands or to individual trees should be prevented. Do not chop into trees, dig up or damage roots, push deep earth fills over roots, or pile lumber or green logs near trees. Watering and fertilizing may improve the condition of a tree and lessen the injurious effect of the beetle.

Trees dying from attack by other insects often serve as good breeding areas for the red turpentine beetle. They should be cut down, and removed from the area or properly disposed of. Freshly cut stumps, another potential source of infestation, should be debarked or sprayed.

California Flatheaded Borer

Robert L. Lyon[1]

The California flatheaded borer (*Melanophila californica* Van ~~Dyke) has been~~ responsible for the death of many valuable Jeffrey and ponderosa pine trees in the West. The insect appears most ~~commonly in Idaho~~, Oregon, and California but is also found in Nevada and Washington (fig. 1).

Most of what is known of the insect's biology has been learned from studies in California where it is the most destructive. Here conditions favorable to the insect are common in pine stands along the east slopes of the Sierra Nevada and the Cascade Range, in the foothills of the Sierra Nevada, in the Coast Ranges, and in the mountains of southern California. Most often the insect infests pines growing on shallow or rocky soils in stands at the fringe of forest areas where rainfall is light; it also attacks stands on better sites.

A serious pest, the flatheaded borer can kill a tree outright. Usually, though, the insect is found in trees along with other destructive pests: the western pine beetle (*Dendroctonus brevicomis* Le Conte), the Jeffrey pine beetle (*D. ponderosae* Hopkins), and pine engravers (*Ips confusus* (Le Conte) and *I. oregoni* (Eichhoff)). The borer often attacks a tree first and predisposes it to further attack by *Dendroctonus* beetles. A tree that survives borer attacks may subsequently be killed by bark beetles. Trees top-killed by pine engravers may be killed by supplementary attacks of the borer in the lower crown and bole.

[1] Research entomologist, Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture.

Hosts

The California flatheaded borer primarily attacks ponderosa and Jeffrey pines. In stands composed of a mixture of these two species, the insect is more often found in Jeffrey pine. The borer also attacks sugar, Coulter, Monterey, Digger, and knobcone pines.

The flatheaded borer usually attacks living trees of all size classes above the sapling or pole stage. It is found more commonly in trees that are declining in vigor than in healthy vigorous trees. The borers may continue their development in trees when they are felled or when they are killed by bark beetles or other agents. They may also continue their development in tops and limbs left as slash after a logging operation. Although the borer may sometimes attack dead trees or slash, its survival in dead material varies.

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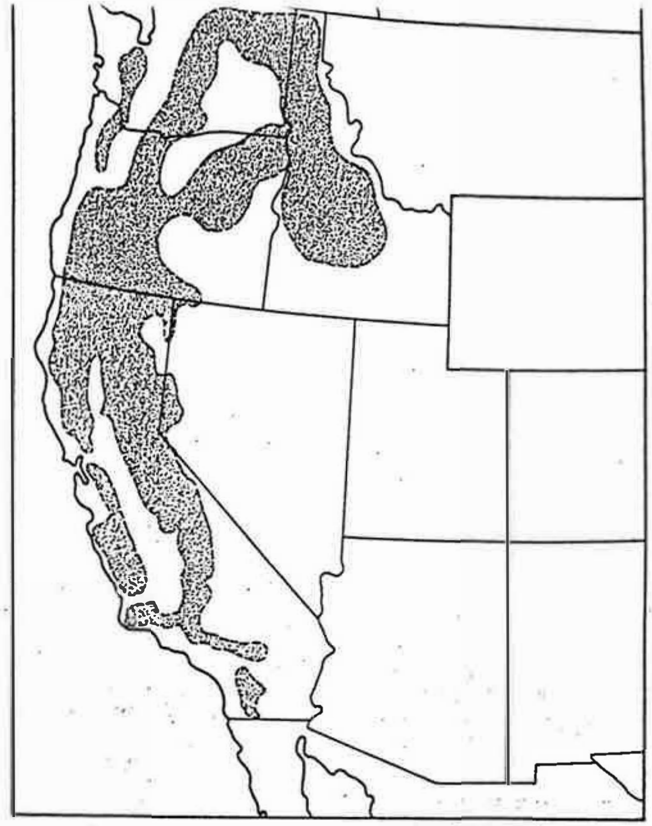

Figure 1.—Distribution of the California flatheaded borer.

The borer can attack the entire length of the bole of the host tree and the basal parts of heavier limbs. It can infest only a part of a tree, such as the top, the midbole, or a strip on one side.

Evidence of Attack

The general appearance of an infested tree is not always a reliable guide to the insect that has attacked it. Trees showing symptoms of poor vigor can be a suitable food source for bark beetles as well as for the borer. Some trees are attacked repeatedly by the borer and yet do not die. When trees are repeatedly attacked for several years, however, they show a progressive decline. Decline in vigor is usually expressed by thin crowns, shorter and fewer needles, dead limbs in the living crown, and yellowish-tinted foliage (fig. 2).

Concrete evidence of flatheaded borers in trees of poor vigor can be found by peeling off a section of bark. If the flatheaded borer has attacked a tree, the surface of the exposed wood will have winding, warty ridges 1 or more inches long (fig. 3, *B*). These narrow linelike ridges are formed when new wood grows over the tiny

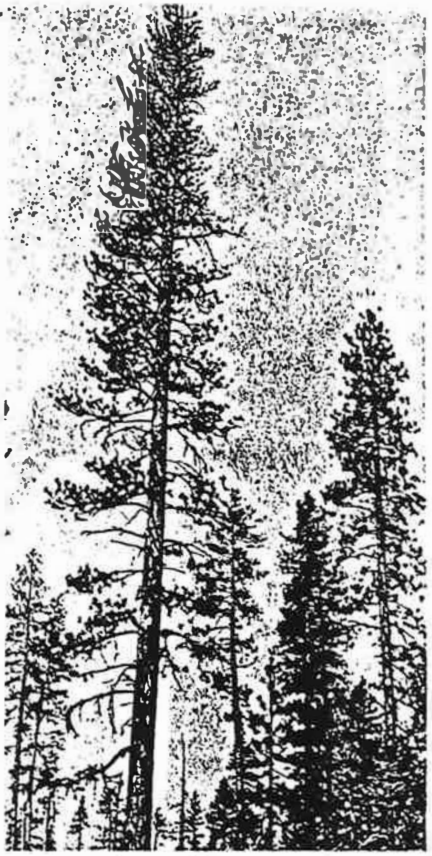

Figure 2.—Decline in vigor of ponderosa pine is often associated with repeated flatheaded borer attacks.

galleries produced by young borer larvae feeding on the innermost bark tissues lying next to the wood. The healed-over larval galleries may be numerous over the exposed wood, and their mirror image will be seen as an impression on the opposing bark surface.

When a tree dies from flatheaded borer attacks, its foliage first turns yellowish green. Later the foliage turns straw color, then reddish brown to brown. Usually the borers have matured and emerged from the tree before the casionally they emerge before the foliage turns straw color or when it is only beginning to show a yellowish cast. Small oval exit holes opening at the bark surface are evidence that the adult borers have abandoned the tree (fig. 3, *C*).

In dead or dying trees, the presence of flatheaded borers is shown by galleries on the inner surface of the bark. The galleries are made by the larger, maturing larvae. They wind about through the tissues lying next to the wood, at times occupying most of the inner bark surface. They are mostly 10 to 15 millimeters wide and are packed solid with larval excrement, which is deposited in a clearly defined, concentric, crescent-shaped pattern (fig. 3, *A*).

The work of the California flatheaded borer may be confused with that of the pine flatheaded borer (*Melanophila gentilis* Le Conte) since the two species have common hosts. The pine flatheaded borer does not attack living trees but develops in felled logs and slash or in windfalls and other dead or dying trees. There are no healed-over galleries since the host is dead or dying when attacked by the pine flatheaded borer.

Life States

The adult California flatheaded borer is 7 to 11 millimeters long and 3 to 4 millimeters wide. It is elliptical and is brownish black and bronzed above and brassy green below (fig. 4, *A*). About 60 percent of the adults have one to three yellow spots on each wing cover; 40 percent have none. The pine flatheaded borer, on the other hand, is bright blue green with unspotted wing covers.

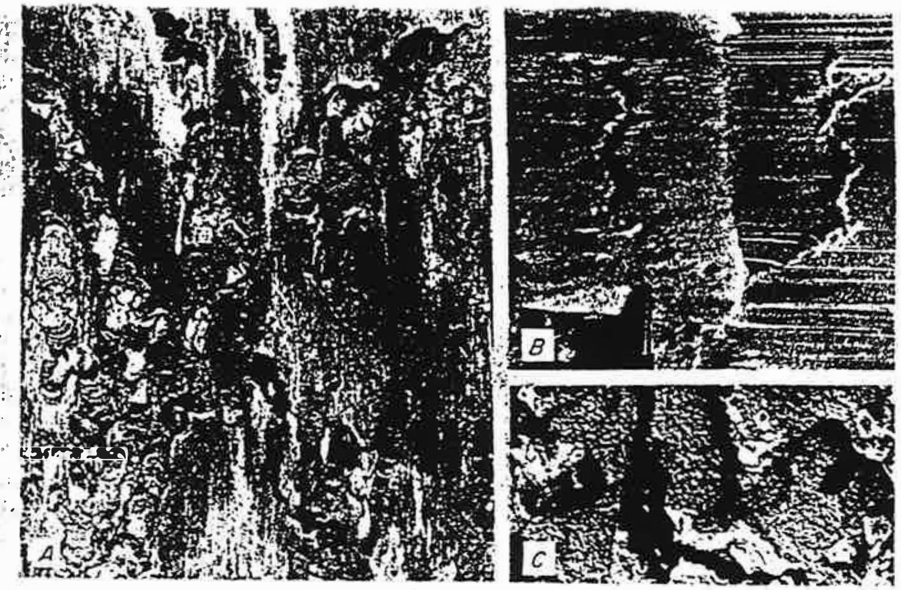

Figure 3.—Evidence of attack by the California flatheaded borer: *A*, Galleries of maturing larvae on the inner surface (×⅓); B, left, exposed mine of a young larva showing the partially healed mine in the bark; right, the same mine in the wood with the larva at its terminus (×⅔); and *C*, exit holes in the outer bark made by the adult (×1⅓).

The eggs are creamy white when first laid and turn yellowish as they develop. They are generally flattened and oval in outline (fig. 4 *D*). Most of them are about 1 millimeter long and ⅔ millimeter wide.

The young larvae are creamy white with a tinge of brown. They blend with the wood and phloem of the infested tree and are difficult to see. The forepart of the larva's body is slightly enlarged laterally, having a "horseshoe-nail" shape characteristic of the family Buprestidae. The forepart of the body of the older larva is much enlarged. The full-grown larva (fig. 4, *E*) is creamy white and about 25 millimeters long. In the last instar (prepupal), the larva shortens, it thickens greatly, and its body bends double (fig. 4, *F*).

The pupa is the same size as the adult. It is translucent white at first, changing to the color of the adult as it develops. The antennae, wings, and upper surface of the abdomen remain a clear translucent white until just before the pupa become an adult (fig. 4, *B* and *C*).

Habits

The adult beetles emerge from May to August; the peak of emergence is usually in June or July. The peak and the spread of emergence, however, may vary in the different parts of the insect's' range—especially from north to south and at various elevations.

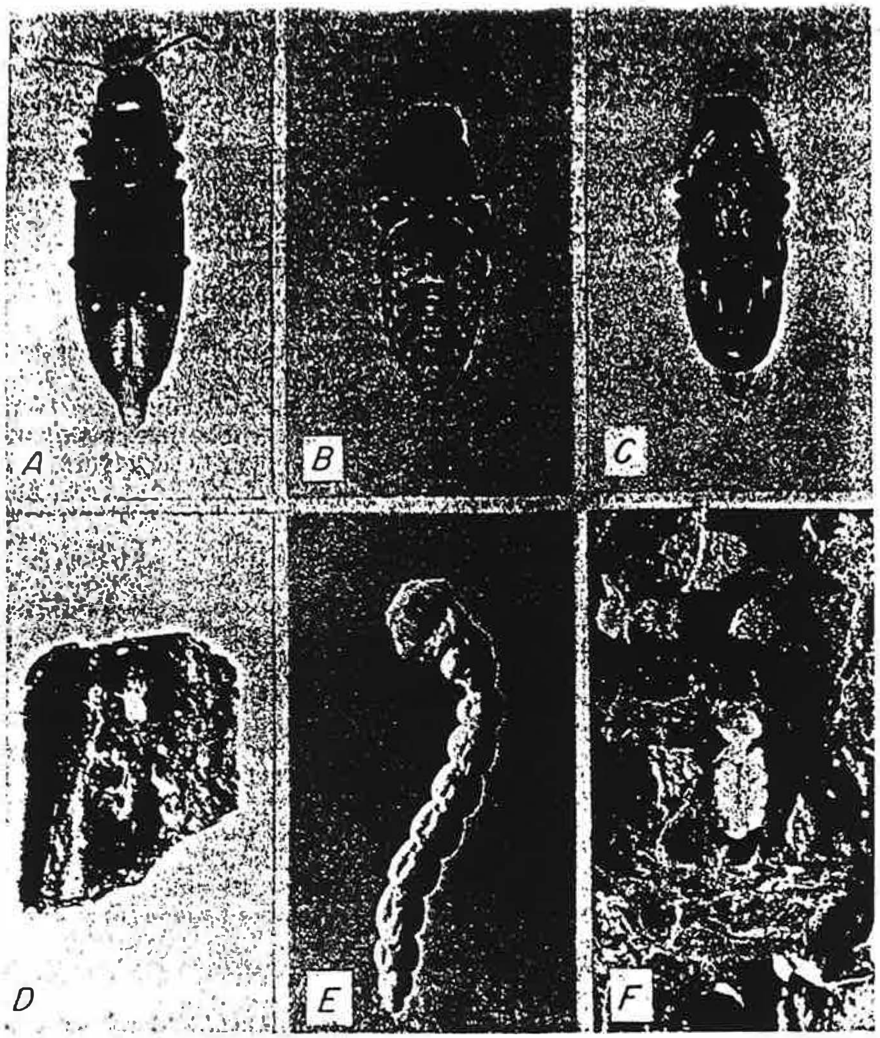

Figure 4.—Life stages of the California flatheaded borer: *A,* Adult (×4); *B,* pupa, dorsal view (×3); *C,* pupa, ventral view (×3); *D,* eggs on underside of a bark scale (×4); *E,* full-grown larva (×3); *F,* prepupal larva in outer bark (×2).

Local weather conditions have a profound influence on adult emergence and may greatly delay or accelerate it.

When the adults emerge, they fly to green host trees and feed on the foliage. If the female is to develop viable eggs she must feed on foliage. The adult clings to the needle sheath, or just above it, and feeds on the exposed fascicle of needles, usually of the current season's' growth. Most feeding is confined to the lower inch of the exposed needle although feeding elsewhere along the edge of the

injure the tree seriously.

The adult lays eggs from June through August. The eggs are placed under bark scales bordering on crevices. About 60 percent of the eggs are deposited singly or in pairs. The remainder are usually laid in groups of three to eight.

The eggs hatch in from 1 to 3 weeks. The newborn larva mines directly to the cambium, turns, and mines through the innermost phloem tissue next to the wood in an approximately horizontal direction. The mine of the very young larva is at first tiny and scarcely wider than the larva itself. As the larva progresses, it fills the mine behind it with a slender homogeneous thread of frass.

The life span of the California flatheaded borer varies. The larva may grow steadily larger and reach the prepupal instar in one season; or it may remain small, feeding and progressing slowly throughout the season, and overwinter in this form. When development is slow and the larva remains small, it is termed an "incipient larva"; the mine it makes is healed over by the tree, and the warty ridges typifying this species are thus formed. The tiny "incipients" may survive for 2 or even 3 or 4 years, but their mortality rate is high. Galleries of incipient larvae can be found imbedded in the wood of trees that have withstood repeated attacks by the borer over several years.

Incipient larvae that survive eventually enter a phase of development in which they grow rapidly. This phase, which usually starts in early June, does not begin until the tree is either dead or dying.

feeds more extensively, destroying much of the phloem tissue. The full-grown larva constructs a pupal cell in the outer bark or sometimes in the outer sapwood of thin-barked trees. It then stops feeding and becomes a prepupal larva. Generally this stage is reached before winter and can be found from July on. The insect usually overwinters as a prepupal larva within the pupal cell. Pupation takes place the following spring mostly in June or from May to July. The insect remains a pupa for about a month and then changes to an adult thus completing the life cycle.

Sometimes the insect does not become a prepupa before cold weather but passes the winter in the actively feeding stage. When this happens it becomes a prepupa in spring. Broods of this kind probably suffer heavy mortality. When the larvae do survive and become prepupae most of them undergo a diapause. They remain as prepupae throughout the summer and following winter; then they pupate and emerge as adults in the spring.

Biotic Control

Little is known about the climatic and biotic forces that hold populations of the borer in check or about which life stage is most affected. It is known, however, that at times a large part of a brood of larvae die when still very young.

Small hymenopterous parasites infest the eggs and larval stages of the borer. Also the black-bellied clerid (*Emoclerus lecontei* Wolcott) and the blue-green trogositid (*Temnochila virescens* (Fabricius)) have been observed attack-

peckers feed on the prepupal larvae by pecking through the bark to the pupal cell located close to the surface. The effectiveness of these agents in controlling the borer has not been determined.

Direct Control

Sanitation-salvage logging—a selective cutting of trees of poor vigor—is an effective method of controlling the flatheaded borer in stands of merchantable timber. The selective cutting of decadent trees helps reduce the borer population because such trees usually are most heavily infested. The partial cutting of timber stands may not be economical where most trees are small or unmerchantable. Other methods of control may need to be used in forests that are devoted to recreational use and where logging is not permitted.

The borer can also be controlled by cutting infested trees and peeling and burning the infested bark. This is done during the winter months while the borer is prepupal and in the outer bark.

The flatheaded borer can be controlled by applying water emulsions or penetrating oil sprays to the outer surface of the bark of felled trees while the insect is in the larval stage. A suggested spray mixture is 1 pint of 85-percent ethylene dibromide concentrate in 5 gallons of No. 2 fuel oil. Apply the spray liberally to the bark of the felled tree so that the solvent will carry the insecticide to the inner layers of bark tissue where the flathead larvae occur.

Lindane sprays are also effective. Water emulsions or solutions in No. 2 fuel oil of 1.5-percent lindane are applied until the bark is wet. To prepare 15 gallons of oil spray, mix 1 gallon of 20-percent lindane oil solution into 14 gallons of No. 2 fuel oil. Or, if a water emulsion spray is to be used, mix 1 gallon of 20-percent lindane emulsifiable concentrate with 14 gallons of water. Apply either spray until the bark is completely wet.

When using either a lindane or ethylene dibromide spray, the tree should be felled and all infested portions of the bark should be carefully treated.

Pesticide Precautions

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or when they may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

WARNING: Recommendations for use of pesticides are reviewed regularly. The registrations on all suggested uses of pesticides in this publication were in effect at press time. Check with your agricultural experiment station, or local forester to determine if these recommendations are still current.

References

THE CALIFORNIA FLATHEADED BORER (MELANOPHILA CALIFORNICA VAN DYKE) IN PONDEROSA PINE STANDS OF NORTHEASTERN CALIFORNIA. A. S. WEST, JR., Canad. Jour. Res., D. 25: 97–118, illus. 1947.

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Use Pesticides Safely

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